

## ABSTRACT

An aerosol TOF MS of the present invention is based on the use of quadrupole lenses with angular gradient of the electrostatic field. On the entrance side, the TOF MS contains an ion-optic system that is used for focusing, aligning, and time-modulating the ionized flow of particles and a deflector modulator that provides alternating deflections of the flow of particles between two positions for aligning the flow with two inlet openings into the TOF MS. As a result, two independently analyzed discrete flows of particles pass through the ion mass separation chamber of the TOF MS without interference with each other. The charged particles fly in direct and return paths along helical trajectories which extend the length of the flight time. The time of the collision and the magnitude of the collision pulse will contain information about the  $M/Z$  ratio for the particles being registered. Multiplication of a single flow of particles into a plurality of independent and spatially separated flows propagating in one chamber increases efficiency of the TOF MS and makes it possible to use it in continuous and high-duty applications with the duty cycle as high as 98%, which is unattainable with any known device of this class.